

IN THE CLAIMS:

1           1. (Cancelled) An apparatus that provides at least one estimated effective age of  
2           a product during the entire life of the product, comprising:

3                       at least one sensor equipped on the product that provides data about  
4           an environmental condition;

5                       a device equipped on the product that uses said data to calculate an  
6           age acceleration factor for said product for at least one of said sensors;

7                       at least one accumulator equipped on the product that provides the  
8           estimated effective age for said product, based upon said age acceleration  
9           factor; and

10                      a display equipped on the product capable of presenting said  
11           estimated effective age to a user of said product.

1           2. (Cancelled) The apparatus of claim 1, wherein said sensor includes an analog  
2           to digital conversion function, and wherein said device that uses said data to  
3           calculate an age acceleration factor is a digital processor.

1           3. (Currently Amended) An apparatus that provides at least one estimated  
2           effective age of a product during the entire life of the product, comprising:

3                       at least one sensor equipped on the product that provides data about  
4           an environmental condition, the sensor further includes an analog to digital  
5           conversion function;

6                       a device equipped on the product that uses said data to calculate an  
7           age acceleration factor for said product for at least one of said sensors, said  
8           device is a digital processor programmed to use said data to calculate an  
9           Arrhenius estimation of said age acceleration factor;

10                      at least one accumulator equipped on the product that provides the  
11           estimated effective age for said product, based upon said age acceleration  
12           factor; and

13            a display equipped on the product capable of presenting said estimated  
14            effective age to a user of said product.

15            ~~The apparatus of claim 2, wherein said digital processor is programmed to~~  
16            ~~compute an Arrhenius estimate of said age acceleration.~~

1            4. (Cancelled) The apparatus of claim 2, wherein said digital processor is  
2            programmed to compute a Coffin-Manson estimate of age acceleration.

1            5. (Cancelled) The apparatus of claim 2, wherein said digital processor is  
2            programmed to compute a Hallberg-Peck estimate of age acceleration.

1            6. (Cancelled) The apparatus of claim 2, wherein said accumulator is at least  
2            partially implemented in nonvolatile storage.

1            7. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a  
2            ferroelectric memory.

1            8. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a  
2            flash memory.

1            9. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a  
2            hard disk.

1            10. (Cancelled) The apparatus of claim 6, wherein said nonvolatile storage is a  
2            volatile memory element, with continuity of power provided by a battery.

1            11. (Cancelled) The apparatus of claim 1, wherein said sensor produces an  
2            analog voltage output, said analog voltage output varying substantially  
3            linearly responsive to a change in temperature, wherein said voltage output is  
4            said data.

1            12. (Currently Amended) An apparatus that provides at least one estimated  
2            effective age of a product during the entire life of the product, comprising:

3            at least one sensor equipped on the product that produces data in the  
4            form of an analog voltage output that varies substantially linearly responsive

5           to a change in temperature;

6                   a device equipped on the product that uses said data to calculate an  
7           age acceleration factor for said product for at least one of said sensors, said  
8           device is a VCO, said VCO producing a VCO output signal having a  
9           frequency that varies substantially exponentially responsive to a linear  
10          voltage change on an input of the VCO;

11                   at least one accumulator equipped on the product that provides the  
12          estimated effective age for said product, based upon said age acceleration  
13          factor; and

14                   a display equipped on the product capable of presenting said estimated  
15          effective age to a user of said product.

16          ~~The apparatus of claim 11, wherein said device that uses said data to calculate an age~~  
17          ~~acceleration factor for said product is a VCO, said VCO producing a VCO output~~  
18          ~~signal having a frequency that varies substantially exponentially responsive to a~~  
19          ~~linear voltage change on an input of the VCO.~~

1           13. (Previously presented) The apparatus of claim 12, wherein said accumulator  
2           is a counter; said counter being implemented, at least in part, in a nonvolatile  
3           or effectively nonvolatile technology, and wherein said counter is clocked by  
4           the VCO output signal.

1           14. (Original) The apparatus of claim 13, wherein said display is electrically  
2           coupled to selected bits of said counter.

1           15. (Cancelled) A method for producing one or more estimates of effective age  
2           of a product, during the entire life of the product, comprising the steps of:  
  
3                       sensing, using a sensor equipped on the product one or more  
4           environmental conditions;  
  
5                       computing, using a computer equipped on the product, an age  
6           acceleration factor for each of the environmental conditions sensed, using a  
7           model that relates the environmental condition to the age acceleration factor;  
  
8                       computing, using the computer equipped on the product, effective age  
9           values, using said acceleration factors;  
  
10                      storing, using a storage equipped on the product, said effective age  
11           values into nonvolatile storage; and  
  
12                      displaying, using a display equipped on the product, said effective age  
13           values to a user of said product on a display.

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1           16. (Cancelled) The method of claim 15, wherein the step of computing an age  
2           acceleration factor comprises the use of the Arrhenius equation, the Hallberg-  
3           Peck equation, or the Coffin-Manson equation.

1 17. (Cancelled) The method of claim 15, wherein the step of computing effective  
2 age values further comprises the steps of:

3 time integrating the age acceleration factor for each of the  
4 environmental conditions sensed, resulting in an effective age for the product  
5 according to each said model;

6 computing a normalized effective age for some or all of the effective  
7 ages by dividing the instant effective age by a wall clock age;

8 computing an effective life used value for some or all of the effective  
9 ages by dividing the instant effective age by a predetermined estimate of life  
10 of the product; and

11 computing an effective life remaining value for some or all of the  
12 effective ages by subtracting said effective life used value from "1".

1 18. (Cancelled) The method of claim 15, wherein the step of displaying said  
2 effective age values further comprises the steps of:

3 determining if any of said values are outside of predetermined ranges;  
4 and

5 alerting the user if any of said values are outside of predetermined  
6 ranges by lighting a light, sounding an audible alarm, or presenting said  
7 values on said display.

1 19. (Previously presented) An apparatus that provides at least one estimated  
2 effective age of a product comprising:

3 at least one sensor that provides data about an environmental  
4 condition;

5 a device that uses said data to calculate an age acceleration factor for  
6 said product for at least one of said sensors;

7 at least one accumulator that provides the estimated effective age for

8           said product, based upon said age acceleration factor; and

9                   a display capable of presenting said estimated effective age to a user  
10          of said product;

11          wherein the at least one sensor includes an analog to digital conversion  
12          function, and wherein said device that uses said data to calculate an age  
13          acceleration factor is a digital processor wherein said digital processor is  
14          programmed to compute a Hallberg-Peck estimate of age acceleration.

1           20. (Previously presented) A method for producing one or more estimates of  
2           effective age of a product, comprising the steps of:

3                       sensing one or more environmental conditions;

4                       computing an age acceleration factor for each of the environmental  
5           conditions sensed, using a model that relates the environmental condition to  
6           the age acceleration factor;

7                       computing effective age values, using said acceleration factors;

8                       storing said effective age values into nonvolatile storage; and

9                       displaying said effective age values to a user of said product on a  
10          display;

11          wherein the step of computing an age acceleration factor comprises the use of  
12          the Arrhenius equation, the Hallberg-Peck equation, or the Coffin-Manson  
13          equation.

1        21. (Previously presented) A method for producing one or more estimates of  
2        effective age of a product, comprising the steps of:

3                sensing one or more environmental conditions;

4                computing an age acceleration factor for each of the environmental  
5        conditions sensed, using a model that relates the environmental condition to  
6        the age acceleration factor;

7                computing effective age values, using said acceleration factors;

8                storing said effective age values into nonvolatile storage; and

9                displaying said effective age values to a user of said product on a  
10       display;

11       wherein the step of computing effective age values further comprises the  
12       steps of:

13                time integrating the age acceleration factor for each of the  
14       environmental conditions sensed, resulting in an effective age for the product  
15       according to each said model;

16                computing a normalized effective age for some or all of the effective  
17       ages by dividing the instant effective age by a wall clock age;

18                computing an effective life used value for some or all of the effective  
19       ages by dividing the instant effective age by a predetermined estimate of life  
20       of the product; and

21                computing an effective life remaining value for some or all of the  
22       effective ages by subtracting said effective life used value from “1”.